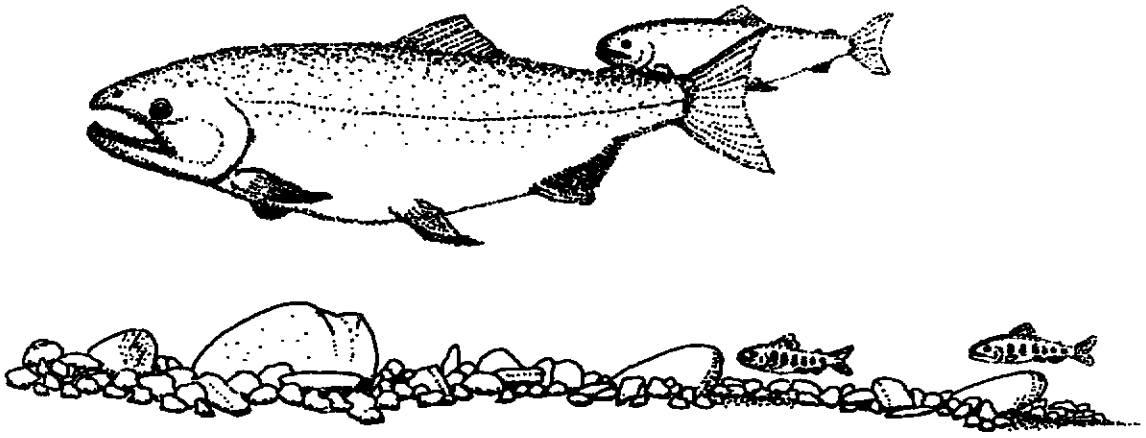
U.S. FISH AND WILDLIFE SERVICE

PROGRESS REPORT OF NATIONAL FISH HATCHERY PROGRAMMING AND EVALUATION ACTIVITIES PUGET SOUND AND COASTAL WASHINGTON, 1989-1990



WESTERN WASHINGTON FISHERY RESOURCE OFFICE

OLYMPIA, WASHINGTON

MARCH 1991

PROGRESS REPORT OF NATIONAL FISH HATCHERY PROGRAMMING AND EVALUATION ACTIVITIES PUGET SOUND AND COASTAL WASHINGTON, 1989-1990

David P. Zajac

U.S. Fish and Wildlife Service
Western Washington Fishery Resource Office
Olympia, Washington

March 1991

PREFACE

The purpose of this report is to provide an annual update of hatchery programming changes and evaluation activities. Although this report contains some analysis of existing data and recommends changes to programming activities, the intent is to provide periodic updates and not comprehensive analyses of the various programs. Rather, individual reports will be generated that will encompass many years of data concerning individual programs and will provide detailed analysis of the results. Those reports will normally address specific evaluations and will be generated by U.S. Fish and Wildlife Service, Western Washington Fishery Resource Office, Olympia, Washington.

TABLE OF CONTENTS

LIST OF TABLES

INTRODUCTION

This report contains information regarding August 1, 1989 to July 31, 1990 hatchery programming and evaluation activities at Makah, Quilcene, and Quinault National Fish Hatcheries (NFH) (Figure 1). This information has been compiled using the fisheries resources evaluation database system (FRED) designed by the Olympia Fisheries Assistance Office (USFWS, 1988). Much of the data collected using this system will allow extensive correlation of rearing variables to survival estimates in subsequent species-specific in-depth reports. A general summary of the various types of data routinely collected at each facility is presented in Appendix A. More detailed information may be obtained from the Western Washington Fishery Resource Office (WWFRO).

Two major actions occurred during the reporting period which have a direct impact on hatchery evaluation and programming at all three facilities. First, a tagging and marking trailer was constructed with guidance from Regional Office and WWFRO personnel. This allowed us to discontinue the trailer sharing arrangement with the Northwest Indian Fisheries Commission and should accommodate all desired tagging for evaluation at Makah, Quilcene and Quinault NFHs. The trailer was put into operation at Makah NFH on May 4, 1990 and has performed very well. Second, all proposed releases or transfers of eggs or fish from Service facilities in the western region now require advance written approval from the appropriate federal, tribal or state official (Regional Policy Statement 12/18/89). This procedure is generally more time consuming. However, it does document the coordination and movement of fish and gametes.

QUILCENE NATIONAL FISH HATCHERY

A new electric weir was installed at Quilcene NFH during the summer of 1989. The old weir was constantly in a state of disrepair, both structurally and electrically. Ground clearing for the new weir began 7/20/89 and power was turned on 10/23/89. However, gravel movement below the weir has effectively filled in the "hatchery hole" where fish often collected and may have altered the river bed enough to impede upstream adult movement. Also, the electrical field has not worked properly during high flows. Modifications to the weir have been requested (Quilcene Hatchery Manager, pers. comm., 1/25/91). Although adult salmon have been seen above the weir during high water, actual numbers are unknown.

FALL CHINOOK

Discussion/Recommendations Fall chinook have not been propagated at Quilcene NFH since the mid-1970's when the program was discontinued due to poor adult contribution and return (Knudsen et al. 1989). However, this past year Quilcene incubated Hoko fall chinook eggs for the Makah Tribe. The resulting 115,460 fingerlings were tagged using the Service tagging trailer and transferred back to Hoko Pond on May 30, 1990. This is a cooperative program with the Makah Tribe that would have included temporary rearing and tagging at Makah NFH prior to discovery of Viral Hemorrhagic Septicemia (VHS). The entire program will now be maintained at Hoko Pond since incubation facilities

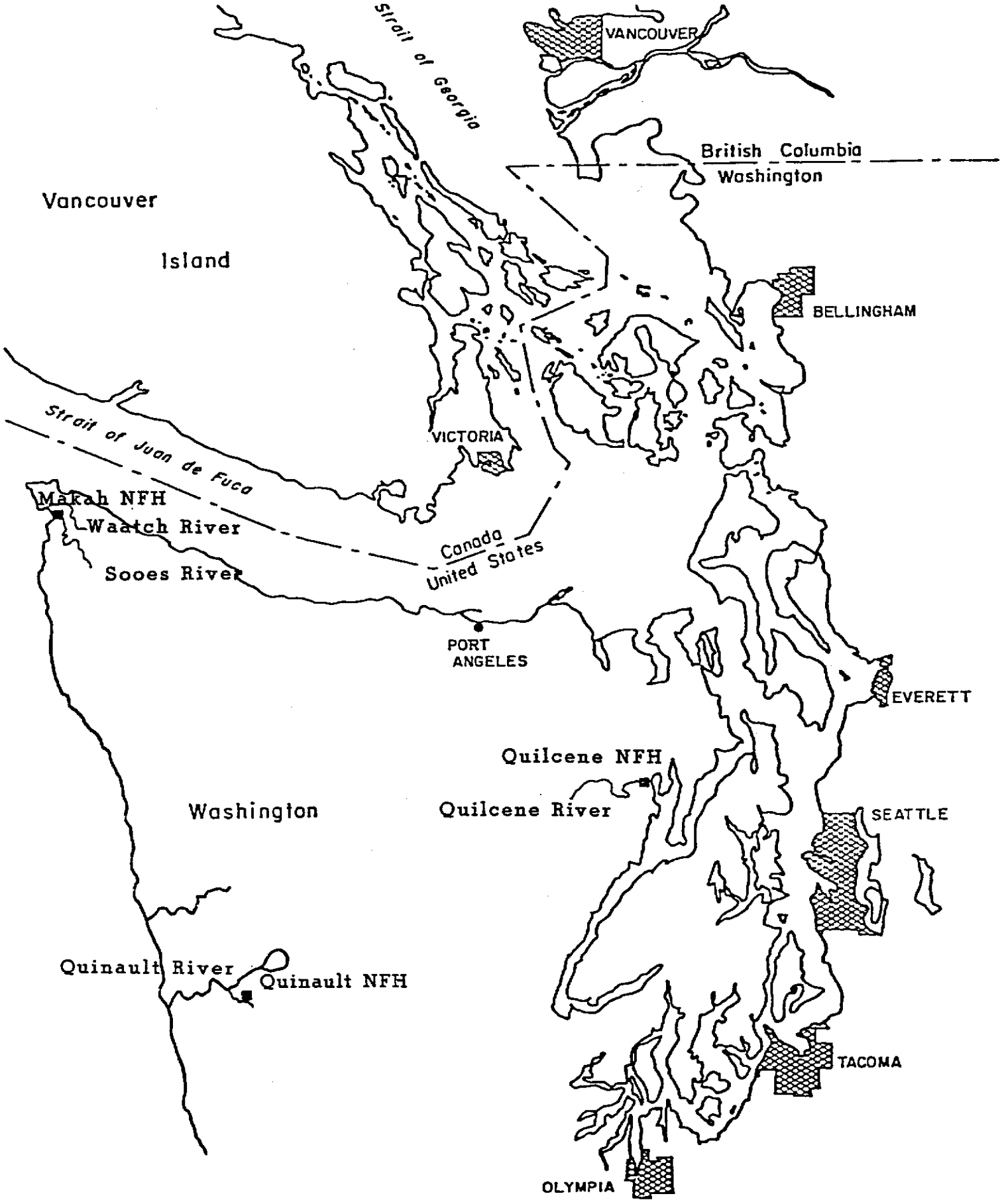


Figure 1. Location of Quilcene, Makah, and Quinault National Fish Hatcheries.

have been installed at that location. In addition, 500,000 fry were transferred to Quilcene from Washington Department of Fisheries' (WDF) Hood Canal Hatchery in February 1990 for temporary rearing. Hood Canal had experienced an over-escapement of adults resulting in more fry than their rearing capacity could handle. The resulting 490,000 fingerlings were transferred to George Adams Hatchery (WDF) in June for final rearing and release.

If time, space, and money are available, we will continue these types of cooperative programs.

SPRING CHINOOK

Restoration of Puget Sound spring chinook continues to be a high U.S. Fish and Wildlife Service (Service) priority. Working with state and tribal agencies, our goal is to restore particular Puget Sound stocks until they can sustain direct harvest. Development of a spring chinook brood run at Quilcene NFH is an important part of this restoration effort. Problems with low survival still exist however, (Hiss et al, 1988). An important step was made through development of the Hood Canal Production Evaluation Program (HCPEP), which includes a 6-year evaluation of spring chinook at Hood Canal facilities (Point No Point, et.al., 1989). This proposal was developed by Point-No-Point Treaty Council (PNPTC), Service, and WDF, and documents temporary production deviations from the Hood Canal Salmon Management Plan. The most important change at Quilcene is addition of Soleduck spring chinook and the transfer of some Quilcene spring chinook to Hood Canal Hatchery. Some Soleduck spring chinook will also be reared along with Quilcene spring chinook at Hood Canal Hatchery. This combination will allow a comparison of relative success of rearing and release strategies of the two stocks at two locations.

Releases and Transfers: The hatchery released 123,573 yearlings (Quilcene stock) at 14.7 fish/pound, and 87,727 yearlings (Soleduck stock) at 10.9 fish/pound on May 7, 1990 (Table 1) and transferred 68,636 fingerlings (Quilcene stock) to Hoodsport Hatchery on May 8, 1990 to meet our commitment to the HCPEP. All fish released were coded wire tagged to accommodate our commitment to the Pacific Salmon Treaty, the HCPEP stock and release location comparison, antibiotic test to control bacterial kidney disease (BKD), and size at release comparisons. Each raceway of spring chinook was tagged with a unique code to accommodate all of these evaluations. Specific tagging information is presented in Appendix B.

Terminal Area Returns, 1989: A return of 82 males and 39 females was recorded at the hatchery during 1989. Most fish were bio-sampled; resulting age structure and length information are presented in Table 2. The run fell far short of our escapement requirement of 500.

Terminal Area Returns, 1990: During the spring and summer of 1990 we monitored returning adults in the Big Quilcene River by conducting snorkel surveys (Table 3). Our objectives were to estimate abundance, determine timing, document poaching, and determine possible broodstock collection sites. The first survey on May 18 showed 12 spring chinook in the river. Approximately half the return had entered the system by mid-June with some

fish showing poaching wounds. Few snorkel surveys were conducted this year due to conflicting projects. However, one other survey was performed on 8/23/90, but was not included in Table 3 because of suspected mis-identification between chinook and incoming coho.

Coded Wire Tag Recoveries: All returning hatchery fish were sampled for coded wire tags. Forty-eight tags were recovered, representing six different codes, all originating from Quilcene releases. In addition to hatchery recoveries, Quilcene spring chinook were caught in Puget Sound sport, Washington ocean troll, and Canadian net and troll fisheries.

Discussion/Recommendations: Since the original weir was not electrically operational in 1989 until July 17, we conducted a snorkel survey from the hatchery up to river mile six. We found no spring chinook and are confident that the original weir operated as a mechanical block to upstream movement during the 1989 return.

We lost seven females as pond mortalities in the 1989 return. This is a usual problem with most species. However, the relative impact is greater in Quilcene spring chinook program because it is a small restoration program. We attempted to correlate hatchery holding time to pond mortality rates. Only two of the mortalities were fish that had been held for a significant length of time. It appears that most pond mortalities were fish with poaching wounds or are generally in poorer condition, regardless of how long they are held in the hatchery.

We attempted to accelerate growth and subsequent size at release of two raceways of spring chinook because of apparent success of larger juveniles released at the WDF facilities. While we were able to attain larger sizes at release compared to previous releases (Soleduck stock 10.9/lb and Quilcene stock 14.7/lb), the fish in the test raceways grew no faster nor larger than the production group which was fed standard rations. Also, we were concerned that increased growth would aggravate bacterial kidney disease. This did not occur. Consequently, we have modified our release strategy to release production smolts at 6/lb, if attainable, in our continuing effort to increase survival.

We will continue our efforts to improve our adult return through fish health management, input to development of fishery regulations, and participation in HCPEP.

COHO

Releases and Transfers: Coho production at Quilcene NFH included 491,303 yearlings and 237,887 fingerlings released on-station (Table 1), 314,630 fingerlings transferred to WDF (Table 4) for seeding under-utilized tributaries in the area, 52,000 fry transferred to Chimacum High School, and 120,000 eyed eggs transferred to U.S. Navy SUBASE Bangor. A portion of the yearling release was coded wire tagged to update our knowledge of distribution and survival. Specific tagging information is presented in Appendix B.

Terminal Area Returns, 1989: Coho returns provided sufficient spawners to meet program needs for 1989. Escapement to the hatchery was 8,219 fish. Of this return, 481 fish were passed upstream to utilize available habitat. Catch records show 12,096 coho were harvested in area 12A net fisheries, 950 in Big Quilcene River net fisheries, and 488 in the Big Quilcene River sport fishery (preliminary, Tony Zinicola, WDF; Peter Dygert, PNPTC; pers. comm.).

Discussion/Recommendations: The 12,096 coho caught in Area 12A net fisheries consist of adults returning from Quilcene Bay net pen releases as well as Quilcene hatchery releases. The actual Quilcene Hatchery contribution will be computed at a later date when tag recovery information becomes available.

The 1989 Quilcene coho return peaked two or three weeks earlier than normal. The reason for this unusually early return is unknown. Consequently, many fish passed through Area 12A prior to the commercial fisheries. This caused the large escapement (8,219) to the hatchery. Because of this large return, two emergency one-day fisheries were opened in the river just below the hatchery. This area is normally closed to all fishing. The first fishery occurred on 9/29/89 and the second on 10/12/89. Catch records show Big Quilcene River harvest of 430 and 50 respectively (Peter Dygert, PNPTC, pers. comm.). However, WWFRO staff monitored the first fishery and estimate that as many as 1,500 coho were harvested successfully by five fishermen. Two male spring chinook were taken as well. We conclude that there was some misreporting of catch area and also that the Quilcene coho program continues to be a major contributor to all fisheries based on the figures presented above.

We are currently required by Hood Canal Management Plan cooperators to pass 400 adult coho upstream of the hatchery to use available habitat. This number is based on 50 smolts produced per female and 2.5 smolts produced per linear yard of stream. However, no cooperators have evaluated the quality of upstream spawning or rearing habitat. The physical passage of 400 adults requires approximately 5-10 man days and there is a constant disease concern since carcasses eventually lodge against the hatchery intakes. Consequently, we conducted two upstream surveys to locate adult distribution, upstream obstacles or blockages, and determine spawning and juvenile rearing habitat. Based on our observations, adult distribution is limited by poaching, minimum gravel areas and obstacles beginning at river mile 4.9 (memo, October 11, 1989). Juvenile rearing habitat is limited as well. Our recommendation of upstream releases of disease-free fry in lieu of adult passage is currently being discussed with Hood Canal Plan cooperators.

During years when shortfalls occur in the spring chinook program, we request permission from the Hood Canal Management Plan cooperators to increase our yearling coho program from the programmed level of 250,000 to more fully utilize our production capacity. We have permission to release 400,000 smolts in 1991. Future coho production adjustments are allowed within the HCPEP.

Subtle changes in hatchery practices and marine environment have probably caused contribution and distribution differences not accurately represented by earlier tagging. Consequently, tagging was initiated with progeny from the

1987 return to assess current contribution rates and distribution patterns and continues with broods 88 and 89. This tagging is also required for comparison to Quilcene Bay net pen releases as detailed in the HCPEP.

CHUM

Releases and Transfers: A total of 2,353,069 chum fry was released at Quilcene NFH (Table 1) consisting of Quilcene, Walcott, and Enetai stocks. Approximately 760,000 of these resulted from an egg transfer from Enetai to Quilcene NFH. Releases at Walcott were discontinued in 1986 for harvest management reasons. No Walcott eggs were available to supplement the Makah chum programs in 1989.

Terminal Area Returns, 1989: Adults returned to both Quilcene NFH and Walcott Slough. Records show a return of 578 males and 559 females to Quilcene and 352 males and 274 females to Walcott Slough. We also captured 32 chums in the Quilcene River for broodstock purposes. Bio-sampling was conducted at both sites with 31.0% of the return sampled at Quilcene and 52.5% at Walcott. Scale analysis showed age four predominated at both locations (Tables 5 and 6). In addition, many fish remained in the river and spawned naturally.

The Quilcene and Walcott programs also contributed to Puget Sound net fisheries. Run reconstruction estimates indicate approximately 2,500 Walcott chum and 2,000 Quilcene chum were caught in the net fisheries.

Discussion/Recommendations: Although releases were discontinued at Walcott after 1985, returns occurred during 1987, 1988, 1989, and 1990. Interestingly, since no release was made at Walcott in 1986 (85-brood), no three-year-olds were expected to return to Walcott in 1988 or four-year-olds in 1989. However, 514 three-year-olds did return in 1988 and 511 four-year-olds in 1989. Hatchery personnel have reported natural spawning in the slough area after hatchery spawn operations have concluded for the season. Also, genetic stock identification performed by WDF in 1985 shows that Quilcene and Walcott stocks are slightly different, even though the Quilcene run was initiated with Walcott stock. This may suggest that other Hood Canal chum stocks are entering the Walcott Slough trap and are subsequently used for broodstock. Regardless of the origin, these returns should be utilized to supplement Makah NFH and tribal programs as requested.

During years when production goals are not met with Quilcene NFH returns, river broodstock capture is attempted and additional eggs are sometimes transferred in from the Skokomish Tribal Hatchery at Enetai Creek. The Enetai program was originally started with Walcott Slough stock.

Coded wire tagging has not been done with chum at Quilcene because marine area sampling for tags is not done. However, Genetic Stock Identification (GSI) is continuing to be developed. Perhaps a reasonable evaluation may be possible using run reconstruction estimates, catch records, escapement data, and GSI. The feasibility of performing such an evaluation in the future should be considered.

MAKAH NATIONAL FISH HATCHERY

Restoration of coastal stocks of salmon and steelhead is a high Service priority. Makah NFH coho and steelhead programs are successful and the chinook program appears to be improving. However, a major setback was experienced when routine coho broodstock disease sampling performed by Olympia Fish Health Center (OFHC) on February 17, 1989, resulted in the discovery of viral hemorrhagic septicemia (VHS), heretofore never found in North America. Through a series of meetings between state, federal, and tribal agencies, fish health protection groups, and consultation with European experts, it was decided to destroy all stocks of fish on February 23, 1989 and to chlorinate the hatchery by June 13, 1989. Since the origin of the disease at Makah was unknown, it was also decided to prevent any further adult passage above the hatchery during the remainder of the 1988 return and to install a downstream screen trap (attached to the existing weir) to prevent any outmigration of potentially infected adults and juveniles from the Sooes River watershed. This trap was installed on the existing weir during the week of April 3, 1989 and no adults were allowed upstream of the hatchery during the return in 1989, as well. We have estimated that the cost of the lost coho, chinook, and steelhead to commercial, sport and Indian fisheries due to VHS is over 3.4 million dollars (memo February 21, 1989).

A major program change is that there will be no adult upstream passage and juveniles will be released from Makah NFH into the Waatch and Sooes watersheds only. Also, the incubation of Hoko fall chinook and steelhead has been discontinued at Makah. Most off-station fry releases from Makah NFH are accomplished by the Makah Tribal Fisheries Department.

FALL CHINOOK

The fall chinook program remains the highest priority at Makah NFH. Return numbers have continued to improve and the Makah Tribe has continued its support of the program by not allowing a directed fishery on the run in 1989. However, all brood-year 1988 progeny were destroyed to control the spread of VHS. No replacement stocks were located. Consequently, the run building process will be slowed and significant gaps will exist in the adult cycles for many years until overlapping ages fill in.

Releases and Transfers: 1,066,702 subyearling fall chinook were released on-station (Table 7). In addition, 162,383 green eggs were transferred to Educket Creek Hatchery for incubation and rearing by the Makah Tribe, then 120,000 of the resulting fry were released as the mitigation group above Makah NFH. The remaining 12,000 were transferred back to Makah NFH as part of the on-station release.

We continue to coded wire tag the on-station release because it is identified as a major production program for the Pacific Salmon Treaty. Specific tagging information is presented in Appendix C.

Terminal Area Returns, 1989: The hatchery return totalled 569 fish. Bio-sampling of 92.6% of the fish indicated returning males were predominately two- and three-year-olds and females were predominately five-year-olds (Table 8). Low water required sporadic but successful ladder operation.

Coded Wire Tag Recoveries: All returning hatchery fish were sampled for coded wire tags, resulting in 127 tags, representing 12 different codes. These recoveries included two fish originally released in Oregon. In addition to hatchery recoveries, Makah fall chinook were caught in Alaska troll and net, Canadian troll and net, and Columbia River net fisheries.

Discussion/Recommendations: Although one entire brood was destroyed because of VHS, we should maintain the native stock integrity by allowing the immediate gap in the adult cycle to recover naturally with returning multiple age classes. To supplement this native stock with a foreign stock could jeopardize our run rebuilding efforts.

The upstream mitigation release of 109,800 was adjusted according to Makah NFH fall chinook fecundity records and has been increased to approximately 121,000 (letter 8/22/89, memorandum 9/11/89).

Since fall chinook continues to be the priority program at this facility, evaluation of production releases should continue. We also have a commitment to coded wire tag this stock as a US/Canada indicator stock. Directed terminal fisheries should not occur on chinook and incidental catch of chinook during coho fisheries should be monitored closely to prevent significant impact on the return.

COHO

Although broodyear 1987 subyearlings and broodyear 1988 eggs and fry were destroyed because of VHS, replacement stock for broodyear 88 was transferred from Quinault NFH. Considerable discussion occurred between steering committee members and National Fishery Research Center - Seattle staff concerning appropriate replacement stocks. Quinault stock was selected because it is an abundant coastal stock and has been transferred to Makah in the past to supplement shortages.

Releases and Transfers: Coho production included 261,826 yearlings and 154,522 fingerlings released on-station, 306,000 mitigation fry released upstream of the hatchery and 69,600 fingerlings released into Educket Creek. Also, 48,863 yearlings were transferred to Educket Creek hatchery on 3/1/90 for imprint and release (Table 7). This transfer group was coded wire tagged also. Yearling releases were coded wire tagged to continue our assessment of total survival. Specific tagging information is presented in Appendix C.

Terminal Area Returns, 1989: A total of 1,237 coho returned to the hatchery during 1989. River net fisheries harvested 840 coho (Table 9). Broodstock was successfully taken from fish entering the facility according to guidelines established during a Makah NFH Steering Committee meeting on August 18, 1987 (minutes dated August 26, 1987).

Coded Wire Tag Recoveries: All returning hatchery fish were sampled for coded wire tags. Three hundred twenty-two tags were recovered. All recoveries were from fish originally released into the Sooes or Waatch Rivers. In addition to hatchery recoveries Makah coho were caught in Alaska troll, Canadian net and sport, Washington troll and sport, and Oregon troll and sport fisheries.

Discussion/Recommendations: Coho return timing continues to be a concern with respect to its overlap with returning fall chinook. Since we cannot allow a fishery to occur on fall chinook until the run has been re-established, any coho returning simultaneously with fall chinook cannot be harvested. We have attempted to reduce the overlap by using later-timed Quinault coho when supplementation was necessary and by using only Makah coho that return after October 15 for broodstock.

In lieu of adult passage, steering committee members agreed to upstream fry releases of 310,000 fry as proposed in memorandum to VHS work group 9/11/89. Fry releases that have previously occurred from Makah NFH to reservation tributaries have been temporarily discontinued due to the VHS classification except for Waatch system releases.

CHUM

Since all broodyear 1988 progeny were destroyed as required to control spread of VHS and no replacement stock was found, the run rebuilding process will be slowed.

Releases: The hatchery released 114,681 fed fry to the Sooes River at 266.1/lb (Table 7).

Terminal Area Returns, 1989: A total of 90 chum returned to the facility in 1989. Seventy of these fish were four-year-olds, 10 were three-year-olds, and 6 were five-year-olds (Table 10). In addition to the hatchery escapement, 460 chum were harvested incidentally during the coho and steelhead fisheries (Table 9).

Discussion/Recommendations: The status of the Makah NFH chum program has been discussed by the Makah Steering Committee. Outside stocks (other than Walcott) have been considered for supplemental use. However, nearby stocks are depressed and use of Nitinat stock (Canada) is precluded by international harvest management concerns regarding impact on the genetic stock identification program. With no other stock available, two courses of action have been taken, including release at a larger size and a proposed release from a tribal net pen in Neah Bay. It is hoped that by releasing chum from a net pen at a larger size, survival will be increased thereby providing broodstock. In the interim, supplemental Walcott/Quilcene stock will be used if available and fry releases will continue on-station.

WINTER STEELHEAD

Although broodyear 1988 subyearlings and broodyear 1989 eggs and fry were destroyed because of VHS, replacement stock for broodyear 1989 was secured from Quinault NFH.

Releases and Transfers: The hatchery released 82,187 yearlings at 7.5/lb on 4/20/90 and 49,905 subyearlings at 248.3/lb on 5/22/90. Also 18,000 yearlings were transferred to Educket Hatchery for imprint and release and 22,125 subyearlings at 295/lb were planted into the Waatch River on 5/22/90 (Table 7).

Since wild adult steelhead could not be passed upstream due to VHS, they were spawned and the resulting 25,391 eyed eggs were planted in upstream gravel by Makah Tribal Fisheries.

Terminal Area Returns, 1989: A total of 162 steelhead returned to the hatchery between December 4, 1989 and February 27, 1990. Bio-sampling was performed to determine age structure and wild composition of the run (Table 11). Ninety-six percent of the steelhead trapped during this period were of hatchery origin based on mark identification and scale analysis and 93.7% of these hatchery origin fish were age three.

A substantial commercial net fishery harvested 2,178 steelhead during the 1989-90 winter season (Table 9). Bio-sampling and mark sampling performed on the catch indicated that 96.6% were of hatchery origin and 3.4% were wild. The major age class was three for hatchery fish and four for wild fish (Table 12). Eleven fish were also harvested for ceremonial and subsistence purposes. In addition to the successful net fishery, approximately 11 steelhead were harvested by sport anglers. This estimate was generated from WDW punch card data and Makah Tribal Fisheries staff estimates (Mark LaRiviere, Makah Tribe, pers. comm.).

Since the weir/ladder operation was extended due to VHS, additional adult steelhead entered the hatchery between April 3 and May 1 (The ladder was in operation from February 27 through April 3 as well, but no fish returned.) Thirty-three fish entered during this period; 90.6% were wild and 9.4% were from the hatchery. Age structure is presented in Table 13.

Mark Recoveries: All returning fish were sampled at the hatchery for adipose marks. Approximately 80% were marked.

Discussion/Recommendations: Our goal with the steelhead program is to maintain temporal separation between hatchery and wild stocks. This will allow river net fisheries to target on hatchery fish and allow the wild run to maintain itself without competition and genetic dilution from hatchery stock. To achieve this, we have in the past assumed that hatchery fish return before February 1 and secured our broodstock before then. Fish returning after that date were assumed to be wild and allowed to pass upstream. During 1987-88, we reviewed past age data and weir operation dates and continued bio-sampling through February 1988. Based on this information, it appeared that hatchery steelhead return until late February (Zajac, 1988). Operation of the weir because of the VHS problem has allowed additional opportunities to examine a potential wild/hatchery stock separation date. Few wild fish enter the system until late February. We recommend that we continue to provide stock

separation using a March first separation date to allow maximum protection to the wild stock and to secure eggs from December through January for the hatchery program.

While summarizing and comparing age information of steelhead caught in the fisheries and fish processed at the hatchery during the same period (November - February) it became apparent that a larger percentage of older fish was taken in the fishery. Approximately 24% of the catch was comprised of four- and five-year-old fish, while at the hatchery only 10% were older fish. A closer look at the information revealed that older fish were generally larger fish. Consequently, it appears that the gill net fishery was selective for larger fish this year. The potential effects of this type of selection on the long-term genetic structure of the stock are unknown.

No adults will be passed upstream in the near future as a requirement of the VHS classification. Fry releases that have previously occurred from Makah to reservation tributaries have been temporarily discontinued. However, disease-free fry may be released into the upper Sooes and Waatch.

Since the VHS classification restricts the passing of wild as well as hatchery adults, we will continue spawning of wild adults and upstream placement of eyed eggs to maintain run integrity.

Since development of the Makah steelhead program included outside stocks (Quinault), the Makah Steering Committee agreed to replace destroyed 1989-brood eggs with 1989-brood Quinault stock. This stock has been used successfully at Makah before. A similar transfer will be required during the 1990 return since 1988-brood subyearlings were destroyed as well.

Adipose clipping of yearling steelhead (to be released in 1991) will continue to determine return rates and further evaluate the hatchery/wild separation date.

QUINAULT NATIONAL FISH HATCHERY

The funding base for Quinault NFH was changed from U.S. Fish and Wildlife Service to Bureau of Indian Affairs in fiscal year 1985. A Memorandum of Agreement was developed whereby the lead programming and hatchery evaluation responsibility, previously performed by the Service, would be accomplished by the Quinault Tribe. Consequently, Service participation in this area has been greatly reduced. However, this arrangement was reversed in 1988 and we expect our involvement in programming and evaluation to increase dramatically. Although we have not yet begun active hatchery evaluation, we have started some basic data collection as described below.

FALL CHINOOK

Releases and Transfers: Hatchery personnel released 579,332 subyearlings on July 16, at 62.7 fish/pound (Table 14) and transferred 246,509 fingerlings to the Salmon River facility (Table 15). The transfer is a cooperative program with the Quinault Tribe using Salmon River stock.

Terminal Area Returns, 1989: Hatchery personnel used 133 males and 229 females for broodstock. These numbers include both returns to the hatchery and adults captured in the Quinault River. Insufficient voluntary adult returns to the hatchery continue to be a problem.

COHO

Releases and Transfers: Between August 8 and August 15, 1989, 319,200 coho were transferred to Makah NFH to replace fish lost due to VHS. On April 12, 627,089 yearlings were released at 16.0 fish/pound. Also, 260,341 fingerlings were planted into reservation tributaries on May 7 at 180.9 fish/pound and two on-station fingerling releases were made on May 7 and July 9 totalling 195,621 (Table 14).

Terminal Area Returns, 1989: Escapement to the hatchery was 1,113 males, 1694 females, and 970 jacks.

CHUM

Releases: On April 19, 491,744 fry were released at 361.0 fish/pound (Table 14).

Terminal Area Returns, 1989: Four hundred males and 176 females returned to the hatchery.

WINTER STEELHEAD

Releases and Transfers: On May 2, 171,825 yearlings were released at 6.4 fish/pound (Table 14). On May 3, 48,356 yearlings were planted into the Hoh River. Also, 45,910 fingerlings were transferred to Chalaat Creek, 156,063 fingerlings to Salmon River Pond, and 99,894 to Washington Department of Wildlife (Table 15). Eyed eggs were also transferred to Washington Department of Wildlife and Puyallup Tribe totalling 647,520 (Table 15).

Terminal Area Returns, 1989: Four hundred forty-two males and 386 females returned to the hatchery.

ACKNOWLEDGEMENTS

Much of the data required for hatchery evaluation, programming, and coordination is collected solely by hatchery staff. That which is not, is collected cooperatively by Western Washington Fishery Resource Office (WWFRO) staff. Also, many suggested program changes and evaluation ideas originate from hatchery personnel. Makah, Quinault, and Quilcene hatchery staff have contributed significantly to the current success and future direction of the hatcheries through their innovative ideas and continuing cooperation with WWFRO. I thank the staff at Makah, Quinault, and Quilcene hatcheries for their continued support and look forward to working with them each year. I also appreciate the cooperation received from the Olympia Fish Health Center. J.M. Hiss and several other WWFRO staff members collected the snorkel survey data reported here.

REFERENCES

Hiss, J.M, D.P. Zajac and E.E. Knudsen. 1988. The spring chinook program at Quilcene National Fish Hatchery, 1981-1987, and projection of catch and escapement to the year 2010. U.S. Fish and Wildlife Service, Fisheries Assistance Office, Olympia, Washington.

Knudsen, E., D. Zajac and B. Kenworthy. 1989. Quilcene National Fish Hatchery coded wire tagging results: coho - brood years 1974-79; fall chinook - brood years 1972-75 (Draft). U.S. Fish and Wildlife Service, Fisheries Assistance Office, Olympia, Washington.

Point No Point Treaty Council, U.S. Fish and Wildlife Service, and Washington Department of Fisheries. 1989. Hood Canal production evaluation program memorandum of understanding. Point No Point Treaty Council, Kingston, Washington.

U.S. Fish and Wildlife Service. 1988. Fisheries resources evaluation database users' manual. Fisheries Assistance Office, Olympia, Washington.

Zajac, D.P. 1988. Plan to minimize the impact of the Makah NFH steelhead program on the Sooes River wild steelhead run. U.S. Fish and Wildlife Service, Fisheries Assistance Office, Olympia, Washington.

Table 1. Quilcene National Fish Hatchery salmon releases made into Washington waters during 1990.

Species	Stock	Brood year	Release location	Date	Number	Size (no/lb)	Weight (lbs)
Spring Chinook	Quilcene NFH	88	Big Quilcene R.	5/7/90	123,573	14.7	8,406
	Soleduck WDF	88	Big Quilcene R.	5/7/90	87,727	10.9	8,049
Coho	Quilcene NFH	88	Big Quilcene R.	5/3/90	491,303	22.2	22,131
	Quilcene NFH	89	Big Quilcene R.	5/22/90	237,887	230.1	103
Chum	Quilcene NFH Walcott Enetai	89	Big Quilcene R.	5/10/90	2,353,069	728.7	3,229

Table 2. Spring chinook age at return to Quilcene National Fish Hatchery during 1989 (98.3% sampled).

	Male		Female		
Age	Expanded number	Mean fork length(mm)	Expanded number	Mean fork length(mm)	Total number in age class
3	53	469	0	-	53
4	26	742	16	758	42
5	3	696	22	802	25
Unknown	-	-	1	-	1
Totals	82		39		121 [1]

Table 3. Counts of brood-year 1990 spring chinook (all ages) in the Big Quilcene River and hatchery. Counts in the river are based on snorkel observations.

Date	5/18	6/20	7/13
Hatchery	0	3	16
River	12	35	20
Totals	12	38	36

[1] There were two additional fish of unknown sex or age.

Table 4. Fingerling releases of brood-year 1989 Quilcene National Fish Hatchery coho made by Washington Department of Fisheries. (All releases were made on April 24, 1990 at 340/lb, except for Big Quilcene release which was made May 15, 1990 at 292/lb).

Location	Number
Tarboo Creek	36,100
East Fork Tarboo Creek	3,800
East Fork Chimacum Creek	35,900
West Fork Chimacum Creek	7,800
Chimacum Creek	56,300
Leland Creek	16,000
Little Quilcene River	58,000
Big Quilcene River/above hatchery	100,730
Total	314,630

Table 5. Chum age at return to Quilcene National Fish Hatchery during 1989 (31.0% sampled).

	Male		Female		
Age	Expanded number	Mean fork length(mm)	Expanded number	Mean fork length(mm)	Total number in age class
3	163	659	243	612	406
4	403	738	304	677	707
5	9	742	7	703	16
Unknown	3	735	5	650	8
Totals	578		559		1,137

Table 6. Chum age at return to Walcott Slough during 1989 (52.5% sampled).

	Male		Female		
Age	Expanded number	Mean fork length(mm)	Expanded number	Mean fork length(mm)	Total number in age class
3	47	663	37	636	84
4	291	761	220	706	511
5	13	795	4	-	17
Unknown	1	671	13	-	14
Totals	352		274		626

Table 7. Makah National Fish Hatchery salmon and steelhead releases made into Washington waters during 1990.

Species	Stock	Brood year	Release location	Date	Number	Size (no/lb)	Weight (lbs)
Fall Chinook	Makah NFH	89	Sooes River	5/14-17/90	1,066,702	66.9	15,943
Coho	Quinault NFH	88	Sooes River	4/16/90	261,826	15.1	17,342
	Makah NFH	89	Sooes River	2/16-21/90	306,000	1085.1	282
	Makah NFH	89	Sooes River	5/23,24/90	154,522	94.6	1,634
	Makah NFH	89	Educket Creek	4/3/90	69,600	435.0	160
Chum	Makah NFH	89	Sooes River	4/26/90	114,681	266.1	431
Winter Steelhead	Quinault NFH	89	Sooes River	4/20/90	82,187	7.5	10,958
	Makah NFH	90	Sooes River	5/22/90	49,905	248.3	201
	Makah NFH	90	Waatch River	5/22/90	22,125	295.0	75

Table 8. Fall chinook age at return to Makah National Fish Hatchery during 1989 (92.6% sampled).

	Male		Female		
Age	Expanded number	Mean fork length(mm)	Expanded number	Mean fork length(mm)	Total number in age class
2	104	436	0	-	104
3	91	721	5	775	96
4	32	869	33	883	65
5	37	978	205	950	242
Unknown	46	763	16	923	62
Totals	310		259		569

Table 9. Monthly Indian set net harvest in the Sooes River during the 1989-90 season (data provided by Makah Tribal Fisheries Management).

Species	Sept.	Oct.	Nov.	Dec.	Jan.	Feb.	Totals
Fall chinook	0	0	0	0	0	0	0
Coho	18 [1]	172	618	31	1	0	840
Chum	0	0	438	22	0	0	460
Steelhead	0	0	341	1,283	512	42	2,178

[1] Test fishery

Table 10. Chum age at return to Makah National Fish Hatchery during 1989 (96.6% sampled).

	Male		Female		
Age	Expanded number	Mean fork length(mm)	Expanded number	Mean fork length(mm)	Total number in age class
3	4	657	6	633	10
4	34	763	36	711	70
5	6	780	0	-	6
Unknown	2	-	2	-	4
Totals	46		44		90

Table 11. Winter steelhead age at return to Makah National Fish Hatchery during 1989 (December 4, 1989 - February 27, 1990, 92.6% sampled).

	Hatchery	Wild	
Age	Expanded number	Expanded number	Total number in age class
3	146	0	146
4	10	5	15
5	0	1	1
Totals	156	6	162

Table 12. Winter steelhead age at harvest during the 1989-90 set net fishery in Sooes River.

	Hatchery	Wild	
Age	Expanded number	Expanded number	Total number in age class
3	1,661	0	1,661
4	438	46	484
5	5	28	33
Totals	2,104	74	2,178

Table 13. Winter steelhead age at return to Makah National Fish Hatchery during 1989 (April 3, 1990 - May 1, 1990, 97.0% sampled).

	Hatchery	Wild	
Age	Expanded number	Expanded number	Total number in age class
3	3	0	3
4	0	23	23
5	0	7	7
Totals	3	30	33

Table 14. Quinault National Fish Hatchery salmon and steelhead releases made into Washington waters during 1990.

Species	Stock	Brood year	Release location	Date	Number	Size (no/lb)	Weight (lbs)
Fall Chinook	Quinault NFH	89	Cook Creek	7/16/90	579,332	62.7	9,240
Coho	Quinault NFH	88	Cook Creek	4/12/90	627,089	16.0	39,193
	Quinault NFH	89	Red Creek	5/7/90	49,756	180.9	275
	Quinault NFH	89	Moclips River	5/7/90	169,150	180.9	935
	Quinault NFH	89	Quinault River	5/7/90	41,435	180.9	229
Chum	Quinault NFH	89	Cook Creek	4/19/90	491,744	361.0	1,362
Winter Steelhead	Quinault NFH	89	Cook Creek	5/2/90	171,825	6.4	26,848
	Quinault NFH	89	Hoh River	5/3/90	48,356	7.8	6,200

Table 15. Fish and eyed egg transfers from Quinault National Fish Hatchery, 1990.

Species	Stock	Location	Date	Number	Stage
Fall Chinook	Salmon River	Salmon River Pond	7/3/90	246,509	fish
Winter Steelhead	Quinault NFH	Chalaat Creek	2/21/90	45,920	fish
	Quinault NFH	Salmon River Pond	3/6/90	156,063	fish
	Quinault NFH	Wash. Dept. Wildlife	5/22/90	99,894	fish
	Quinault NFH	Puyallup Tribe	2/26/90	104,403	eggs
	Quinault NFH	Wash. Dept. Wildlife	2/15/90	543,117	eggs
Coho	Quinault NFH	Makah NFH	8/7-15/90	319,200	fish

Appendix A. Types of data collected at Quilcene, Makah, and Quinault National Fish Hatcheries for hatchery evaluation during the reporting period [1]

Hatchery	Fall chinook	Spring Chinook	Coho	Chum	Winter Steelhead
Quilcene	adult entry fish removal scale sample fish transfer	adult entry fish removal scale sample mark sampling mark recovery ind. spawning fish transfer environment marking specific release general release	fish removal group spawning fish transfer environment marking specific release general release	fish removal scale sample group spawning environment specific release general release	n/a
Makah	adult entry fish removal scale sample mark sampling mark recovery group spawning fish transfer environment marking specific release general release	n/a	fish removal group spawning fish transfer environment marking specific release general release	fish removal scale sample group spawning fish transfer environment specific release general release	fish removal scale sample mark sampling mark recovery group spawning fish transfer environment making specific release general release
Quinault	fish removal fish transfer specific release general release	n/a	fish removal group spawning fish transfer specific release general release	fish removal specific release general release	fish removal group spawning fish transfer specific release general release

[1] See FRED Manual for variables included in the data types presented.

Appendix B. Information related to tag groups released from Quilcene National Fish Hatchery.

Tagging information	Quilcene spring chinook		Quilcene coho
Purpose	indicator stock antibiotic test HCPEP & release size	indicator stock, antibiotic test HCPEP & release size	hatchery evaluation, HCPEP
Project length	on-going	on-going	three years
Year of project	n/a	n/a	second
Brood year	1988	1988	1988
Tag code	5-21-21-R3 5-21-22-R3 5-21-25-R3 5-21-26-R3 5-21-50-R3	5-21-28-R3 5-21-31-R3 5-21-32-R3 5-21-35-R3 5-21-52-R3	5-22-53 5-22-54 5-22-55
Tag date	May 1989	May 1989	November 1989
Stock	Quilcene NFH	Soleduck WDF	Quilcene NFH
Size at tagging	106/lb; 106/lb; 90/lb 125/lb; 106/lb	100/lb; 100/lb; 70/lb 70/lb; 70/lb	45/lb

Appendix B. Information related to tag groups released from Quilcene National Fish Hatchery (con't.).

Tagging information	Quilcene spring chinook		Quilcene coho
Release location	Big Quilcene River	Big Quilcene River	Big Quilcene River
Release date	May 7, 1990	May 7, 1990	May 3, 1990
Size at release	14.7/lb	10.9/lb	22.2/lb
Number marked released	22,206; 21,945; 20,474; 21,664; 9,771	20,496; 20,873; 29,986; 15,113; 11,259	26,404; 25,172; 26,373
Tag retention rate (%)	96.0; 94.0; 90.9; 88.7; 91.7	97.2; 96.0; 94.5; 95.5; 92.5	98.6; 98.8; 99.0
Number unmarked released	0	0	11,572; 12,977; 11,861;
Percent marked at release	100. 0	100.0	69.5; 66.0; 69.0

Appendix C. Information related to tag groups released from Makah National Fish Hatchery.

Tagging information	Makah fall chinook	Makah coho
Purpose	indicator stock	hatchery evaluation
Project length	on-going	on-going
Year of project	n/a	n/a
Brood year	1989	1988
Tag code	5-19-55-R3	5-22-56; 5-22-57; 5-22-58
Tag date	May 1989	December 1989
Stock	Makah NFH	Quinault NFH
Size at tagging	75/lb	30/lb
Release location	Sooes River	Sooes River
Release date	May 17, 1990	April 16, 1990
Size at release	66.9/lb	15.1/lb
Number marked released	102,132	25,909; 25,340; 24,386
Tag retention rate (%)	92.0	98.6; 97.4; 91.9
Number unmarked released	964,570	186,191
Percent marked at release	9.6	28.9